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ABSTRACT

It is not difficult to find information describing how enterprising teachers use telecommunications in their classrooms; however, it is very difficult to find studies describing how teacher education institutions can (or should) employ telecommunications. Two hundred and twenty nine students (all were enrolled in a methods/curriculum course) were involved in a study designed to evaluate the impact of the use of electronic mail and/or INTERNET on undergraduate science education students' attitudes and anxiety levels toward technology before and after extensive use of electronic communications. The results provide differences due to the student's gender, age, major, treatment, and other interesting differences that were not statistically significant. Finally, the document provides helpful hints to program directors and teachers who anticipate exposing students to e-mail and/or INTERNET. (ZWH)

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TELECOMMUNICATIONS AND PRE-SERVICE SCIENCE TEACHERS: THE EFFECTS OF USING ELECTRONIC MAIL AND A DIRECTED EXPLORATION OF INTERNET ON ATTITUDES

by

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presented at the National meeting of the
National Association for Research in Science Teaching

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TELECOMMUNICATIONS AND PRE-SERVICE SCIENCE TEACHERS: THE EFFECTS OF USING ELECTRONIC MAIL AND A DIRECTED EXPLORATION OF INTERNET ON ATTITUDES

Context of the Study

Electronic communication in the form of electronic mail (e-mail), file transfers via computer connections, and direct talk modes via networked computers is now a reality in private life as well as the business world. This quick and efficient technology has become an important means of transferring information for more than 20,000,000 people.

The INTERNET is a conglomerate of approximately 1,700,000 computers across the country and the world serving an estimated fifteen million users (thirty million by the summer of 1994!) (Pool, 93). INTERNET is the evolutionary product of Arpnet (a United States Defense Department network of the early 1970s) and NSFnet (a late 1980s electronic network set up by the National Science Foundation for linking colleges and universities). This network of networks has become the world's largest and most complicated library with approximately fifty thousand databases in the system (Pool, 93).

In July of 1991, the National Science Foundation sponsored a telecommunications meeting of leaders from state Education Departments, universities, and public and private organizations and foundations. This group highly recommended the expansion of INTERNET and assistance from the federal government in connecting public schools in every congressional district to INTERNET (Consortium for School Networking, 1991).

Teachers of today (and especially of tomorrow) will, no doubt, be using this telecommunications in the classroom for communication in the very near future. The fact is, there are some schools that are already using telecommunications. Some schools use e-mail to obtain information and distribute data from school to school. In others, teachers use electronic mail to overcome the isolation of teaching in small communities far from their peers in other schools.

With the thousands of databases available on INTERNET, schools with small libraries and limited resources are suddenly thrust into the information age. Students can use the thousands of databases as information sources. Students can also use services that make current seismographic information or satellite images available with only a few keystrokes or clicks of a mouse. With this type of information available to teachers and students, classrooms and schools will change.

It is not difficult to find information describing how enterprising teachers use telecommunications in their classrooms (Gould, 1991; Honey & Henriquez, 1993; Hopkins, 1991; Lenk, 1988; Lewis, 1991; McCarty, 1991). On the other hand, it is very difficult to find studies describing how teacher education institutions can (or should) employ telecommunications.

Purpose of the Study

Currently, there are no studies available on the use of telecommunications in education methods/curriculum courses. There are also very few articles dealing with how the perspective teacher views educational technology. The articles that are available and connect telecommunications with pre-service teachers deal with student teachers. Apparently, there are either very few colleges and universities attempting to prepare teachers to utilize the communication technologies, or few that are talking about it.

This study is designed to evaluate the impact of the use of electronic mail and INTERNET access on undergraduate science education students' attitudes dealing with the utility and use of electronic communications, as well as their anxiety level towards the technology.

Statement of the Problem

This study attempts to answer two questions. First, "What effect does the purposeful use of telecommunications in a science methods/curriculum course have on student attitudes towards electronic communications?" And, "How will this experience effect their anxiety level dealing with technology in general?"

Questions

The following questions were addressed:

1. What proportion of teacher education students have had training or experience using e-mail and/or INTERNET?
2. What perceptions do teacher education students (science education students in particular) have concerning the usefulness and role of e-mail and INTERNET in the classrooms of the future?
3. What effect does a purposeful use of e-mail and a directed exploration of INTERNET in Methods/Curriculum courses have on the perceptions of the usefulness of telecommunications by teacher education students?
4. What effect does a purposeful use of e-mail and a directed exploration of INTERNET in Methods/Curriculum courses have on the technology anxiety level of teacher education students?

Research Hypotheses

My basic hypotheses are:

1. Most teacher education students are not comfortable with the use of the newer electronic communications technologies.
2. The students who are given a fairly wide range of experiences with the newer communications technologies in methods courses will have a higher comfort level and will be more likely to use (not just talk about) these technologies in their teaching.

Summary of Literature Review

It should be noted that there is a distinct shortage of literature on the use of telecommunications in teacher preparation. At the same time, there is only one extensive study that looks at telecommunications use by teachers in the classroom (Honey and Henriquez, 1993). There are then two assumptions that follow. The first is that the use of telecommunications in teacher preparation is very new. The second is that both teachers in the classroom and university faculty are still trying to decide how to use telecommunications. Much research needs to be done in this area to better understand how telecommunications impacts student/instructor interactions and attitudes of both students and faculty.

The literature clearly shows that computers are widely used in education. The bulk of literature on computers in education seems to deal with computer assisted instruction (9,631 articles found in a recent ERIC search). The use of computers for computer assisted testing and computer managed instruction account for 886 and 843 articles respectively. In recent years, there has been an increase in the number and quality of both programs and hardware for computer interfacing for laboratory measurement. Some of these programs have become quite sophisticated (for example: COACH developed at the Center for Microcomputer Applications, University of Amsterdam,).

Only recently have articles that deal with telecommunications started to appear in the literature. The first study dealing with the use of telecommunications in increasing teacher/student interaction was in 1988 (Downing, Schooley, Matz, Nelson, and Martinez, 1988). This study carried out at the University of

Arizona dealt with the patterns of student/instructor interactions in engineering classes. Since that time, there have been a number of studies dealing with telecommunications and student/instructor interactions that show both an increase in number and sophistication of interaction (Durham and Sunal, 1991; Stahlhut and Hawkes, 1991; Thompson and Hamilton, 1991; Bishop-Clark and Huston, 1992).

It would appear that the teacher preparation institutions are behind the teachers in the field in the use of telecommunications. From the computer anxiety point of view, this may have much to do with the slow development of telecommunications by teachers. It has been shown that computer anxiety goes down with experience using computers (Heinssen, Glass and Knight, 1987; Fann, Lynch, and Murranka, 1989; Kay, 1990; Summers, 1990; Woodrow, 1990). Teachers who have experience using telecommunications while in college would be more likely to use the available technology in their classrooms than those who have not previously used computers. If we expect teachers to have a part in shaping the future and preparing students for the future, those teachers must first have a vision of the technology of the future and be comfortable with that technology.

Colleges of Education have started to employ telecommunications for increasing the ease of communication between student teachers and the university faculty (Durham and Sunal, 1991; Thompson and Hamilton, 1991; Stahlhut and Hawkes, 1991). The student teachers seem to use this added tool for communicating with each other to share experiences and get ideas as well as communicating with their supervisors. Some studies have indicated that there is an increasing the number of interactions and sophistication of interactions between the student teacher and the supervisor (Durham and Sunal, 1991). The interest in telecommunications is not one-sided. Rather, both the student teachers and the university supervisors wish to expand programs that incorporate telecommunications as a tool for communications (Thompson and Hamilton, 1991; Casey, 1992).

Methodology

This study looks at teacher education students. This large group is composed of two smaller groups. These are: 1) the comparison group composed of all students entering the methods/curriculum blocks (junior and senior students entering their professional year) at the University of Nebraska-Lincoln and the secondary science methods students at the University of Nebraska at Omaha; 2) the experimental group, taking their secondary science methods/curriculum block at the University of Nebraska-Lincoln.

Pretest and post test responses for survey subscores from the experimental group were compared to the larger comparison group. Surveys were distributed at both the beginning and end of the fall semester of the 1993-1994 school year.

The survey was designed to determine:

1. the number of educational technology or computer courses that have been taken;
2. the kinds of educational technology the student remembers as being used while in elementary school, high school, and college courses;
3. the kinds of educational technology the student has used as a "teacher";
4. the perceived usefulness of educational technology (and electronic communication in particular) in the classroom;
5. the perceived usefulness of computers in the classroom;
6. the student's attitudes dealing with the use of e-mail and other forms of telecommunications;
7. the student's computer anxiety level using the CARS rating instrument (Heinssen, Glass, and Knight (1987).

Experimental Group's Treatment

This group was the secondary science methods/curriculum class at the University of Nebraska-Lincoln. The same surveys were given to this group as all other methods students.

During the course of the semester when this group took their methods/curriculum block, they used e-

mail for journaling and sending messages to faculty members and each other. At the same time, the class was be shown how to navigate the INTERNET. Class projects included the development of a series of lessons that used the INTERNET for data and information gathering or dispersement.

Control/Comparison Group

Since there is little "control" over the non-experimental groups in this study, it is difficult to refer to this group as a true control group. The control group in this study is more correctly referred to as a comparison group. This comparison group is made up of the Elementary Education majors at UN-L, the Secondary Science majors at UN-O, and the non-science secondary majors at UN-L.

Results

Description of the sample.

There were a total of 229 students enrolled in the methods/curriculum courses that were of interest. 52% of the students responded to the survey (n=117). Of the 229 possible students, there were an undetermined number of dual majors (although only one was a dual major that included Science). The majority of the dual majors were Secondary English/Secondary Modern Language and Secondary English and Secondary Social Studies. These dual majors may account for the lower number of responders than originally anticipated.

The sample can be broken down as follows:

Gender

27.4%	male
68.4%	female
4.3%	unknown gender

Age

75.7%	20-23
12.6%	24-30
1.8%	31-35
1.8%	36-40
3.5%	41-44
3.5%	45-50
5.1%	unknown age

Major

32.5%	elementary education majors
4.3%	secondary art
13.7%	secondary english
6.0%	secondary modern language
20.5%	secondary math
1.7%	secondary social studies
17.1%	secondary science (UN-L)
4.3%	secondary science (UN-O)

For purposes of the analysis, the declared majors were broken up into subgroups. These were:

32.5%	elementary
20.5%	secondary math
17.1%	secondary science (UN-L)
4.3%	secondary science (UN-O)
25.6%	secondary non-science/non-math

Differences in the sample due to gender at beginning of study

The males had taken more computer/technology courses prior to their methods/curriculum block than the females (males averaged 1.8 courses, females averaged .8 courses). This is probably best explained by the majors of the males and females. 72% of the males were science or math majors while 36% of the females were science or math majors.

The females (as a group) held computers to be more useful in the classroom than did the males (a significant but small difference). Upon closer examination, 35% of the females said that they had no prior computer or technology coursework and said that computers were "very useful in the classroom". When the number of examples of educational technology that the respondent could list is compared to the usefulness of computers in the classroom, 28% of the females could list zero or one example of education technology yet those same individuals said that computers are very useful in the classroom. For the males, only 16% did the same thing. This would tend to show that more of the females were indicating a usefulness of computers with neither experience nor examples to backup what they were saying. It is possible that many of the elementary education majors were saying that computers are useful in the classroom because of what they had been told rather than what they had experienced. These students may have been hoping to understand why computers are important while taking the educational technologies course during the semester the surveys were administered.

The last difference between the males of the group and the females was that the females indicated that they would be more likely to say what they think on e-mail than in a professor's office. 68% of the females said that they had never used INTERNET, yet half of that group said that they would be more likely to say what they think on e-mail than in an instructors office. Only the males who had prior experience on INTERNET said that they would be much more likely to say what they think through e-mail. This may be due to an intimidation factor in the office. In the open response section of the survey, the males were the only students who voiced a desire to "talk things out face to face."

Differences in the sample due to age

There were three differences in the sample due to age. These were in major, impression of the future of telecommunications for the educational community, and prior experience with educational technology.

The elementary education majors were dramatically younger than the secondary education majors. All the elementary education majors were between 20 and 22 years old. In comparison, 63% of the secondary students were between the ages of 21 and 23. Of the students over thirty, only 73% of them were second career students.

Dealing with the respondent's impression of the future of technology for the education community, the only students who said that the future of telecommunications is negative were students less than 25 years of age. All of the students over the age of 30 responded that the future of telecommunications for education was very positive. These 'older' students were most probably influenced by their prior occupations. Occupations of the over thirty students included retired military, banking, and insurance. Each of these areas relies heavily on computers and telecommunications. It is very possible that these students see the value of telecommunications from their former positions.

The last difference in the sample due to age lies in remembered use of educational technology while in high school. As might be expected, the older the student, the fewer examples of educational technology used.

Differences in the sample due to major

There are two differences due to major. The first is in the number of computer/technology courses taken. The secondary math students had taken the greatest number of computer/technology courses, (2.2 on average), followed by the Omaha science students (1.6 on average), followed by the UN-L science (.77 on average). Since the math majors are generally the students who are also computer majors, it makes sense that they would have taken more computer/technology courses than the other groups. The Omaha science group had taken their educational technology course the semester prior to the methods/curriculum block while the UN-L students take the educational technology course as a part of the methods/curriculum block.

The second difference was in the number of examples of educational technology that the students could list at the beginning of the semester. The Omaha secondary science students could list more examples than any of the other groups. This is most probably due to the Omaha education students taking an educational technology course before their methods/curriculum block while the UN-L students take this course with their methods/curriculum block.

Differences due to the treatment

There were a number of broad areas that were of concern in pre/post testing. These included the following:

1. the overall computer anxiety level of the students;
2. questions dealing with the perceived usefulness of computers are in the classroom;
3. questions dealing with communications between student and instructor using e-mail;
4. the student's perception of the future of telecommunications for the education community.

It should be noted that there were statistically significant ($a \leq 0.05$) changes over time for three of the four factors listed above (no difference over time for perceived comfort using e-mail between student and instructor). I also need to point out that there were no changes over time that showed statistical significance between majors. This is most probably due to the small number of subjects who were willing to take the time and effort to fill out the surveys.

Interesting differences/discussion

There were a number of differences that appeared to be both important and interesting although they were not shown to be statistically significant. These need further testing with larger groups of students, possibly using more than one university.

The first difference is in computer anxiety level (based on the CARS scale). The CARS scale is a nineteen question survey that allows for an measure of computer anxiety. Each of the groups had an increase in their comfort level (decrease in computer anxiety), but one group had a very small decrease in anxiety. Each of the groups who took an instructional technology course along with their methods/curriculum block had a marked decrease in computer anxiety. The Omaha science group was the only group who was not taking an educational technology course along with their methods/curriculum block (they had taken the educational technology course prior to methods). The Omaha science group had less than half the amount of change in computer anxiety level as did any of the other groups. This seems to indicate that for education majors to be comfortable with computers/technology in the classroom, they need to talk about how to use the technologies along with the teaching methods.

A second point is the perception of computer usefulness in the classroom. Here there were increases in the perception of usefulness for all of the groups, but some were much greater than others. The elementary group started with a higher perception of computer usefulness and had the smallest increase.

The educational technologies course taken by the UN-L students seemed to be an equalizing factor for those students. Although there were differences in perception of computer usefulness before the semester, at the end of the semester, there was little difference between the groups. The exception to this was the secondary math group. Here the perception of computer usefulness in the classroom rose far more than any of the other groups, and to a level far greater than the other groups.

Another point of interest was in the student's perception of e-mail's usefulness between instructor and student. Although not a significant change, all but one of the groups reported a lower perception of the use of e-mail between instructor and student. The second set of responses may indicate a more accurate view of the student's view. At the beginning of the semester very few of the students reported using e-mail or the INTERNET. The results from the second survey represent a generally more informed and experienced perspective. The group who's impression of e-mails use between instructor and student went up, was the elementary education majors. This group's response seems especially interesting since the elementary education majors at the end of the semester reported less us of computers and the INTERNET than at the beginning of the semester. Part of the reason for the decrease for the Science group could be problems with equipment. This will be discussed in the implications section.

Computer and INTERNET use by the students is also of interest. These are interesting not because a group's use went up, but because of who's use went down. All of the respondents from UN-L were enrolled in a educational technologies course as a part of their methods/curriculum block. In this course, everything that is done is done on a computer. All of the groups had an increase in computer use during the semester (increase, but not significant) except the elementary education majors. The computer use by elementary education majors went down. Part of the reason for this being odd is that these elementary education majors were enrolled in both math and science methods. Both of these tend to be natural places for fostering of the use of computers for gathering and manipulating information.

The last area was the student's perception of telecommunications's future for the educational community. Here all of the groups showed a more positive perception of the future at the end of the semester except the Omaha Science group. This is the only group who did not have an educational technology course as a part of the methods/curriculum block. This would indicate that even if students have experience with telecommunications (as the Omaha group did prior to their methods/curriculum block), there is a need for an integration of the technology use with the methods/curriculum block for the students to see the potential for future use in the classroom.

Discussion/Conclusions

Implications/Lessons

Through the course of the semester, a number of lessons were learned that were not intentionally part of the study. These lessons dealt with the mechanics of having a methods/curriculum class on-line during the semester.

1) A major problem encountered by the treatment group (science) dealt with equipment. The computers arrived much latter than anticipated. A rush job of installing and testing software and modems was the result. Although the problems that were caused by the hurried installation of modems and software into old machines were overcome, there is no doubt that some of the technical problems students encountered influenced their attitudes. Equipment must be ready to go at the beginning of the semester and everything must be thoroughly tested.

2) The students' first attempt at using telecommunications needs to be successful. A positive experience early to start with is essential for the continued use of telecommunications. Hardware problems, software problems, and the mainframe being "down" should be avoided at all cost when students are just starting out.

3) Replying to nineteen students who are sending journals by e-mail on a weekly (sometimes much more often) basis can take a tremendous amount of time. Although this was known prior to the semester, the reality of the time commitment is very different from a knowledge that "it will take a lot of time".

4) E-mail replies from the instructors must be prompt! One of the positive aspects of e-mail is quick communications. To keep the students from becoming disenchanted, the instructors must reply to student messages in a timely manner.

5) The greatest use of INTERNET by the Science students was late at night. It was not uncommon to get messages from students that were sent between 11:00 PM and 3:00 AM. The students will log on when they have time and there are lines free.

6) Students who do not have a computer at home, where they can work when they have time and when the phone lines are open, will not use telecommunications. Many students are very reluctant to journey across campus in the middle of the night to use a terminal in a campus computer lab.

7) Students will want to keep their accounts after they are out of the methods/curriculum course. This is also true of students finishing their student teaching. Most student accounts on the university computers are cancelled at the end of each semester. Accounts on state Department of Education computers are preferred over university computers for this reason.

Conclusions

First and foremost, there is a need to expand this study. Within the results were a number of interesting yet statistically nonsignificant differences. An expansion of this study with larger groups will either show that these were true differences or that they were indeed not significant. In either case, more work needs to be done in this area.

It is apparent that neither the gender nor the age of the student had a major effect on computer anxiety or attitudes about the future of telecommunications. More important factors seem to be prior experience with educational technologies and prior computer/technology courses. This study also shows the importance of taking an educational technology course along with the methods/curriculum block. The usefulness of the educational technology courses seems to be in helping the students see how to incorporate the technologies in the classroom. This may, of courses, be possible without an educational technology course if the use of technologies is built into the methods/curriculum block.

References

Bishop-Clark, C. & Huston, B. (1992). Using telecommunications in teacher education: A student perspective. In D. Carey (Ed.). Technology and teacher education annual 1992. Proceedings of the annual conference on technology and teacher education. (1992). Association for the Advancement of Computing in Education.

Casey, J. (1992). TeacherNet: Student teachers form a community of teachers. In D. Carey (Ed.). Technology and teacher education annual 1992. Proceedings of the annual conference on technology and teacher education. (1992). Association for the Advancement of Computing in Education.

Consortium for School Networking. (1991). Position paper on school networking. In D. Carey (Ed.). Technology and teacher education annual 1992. Proceedings of the annual conference on technology and teacher education. (1992). Association for the Advancement of Computing in Education.

Downing, T. E., Schooley, L. C., Matz, E. M., Nelson, L. N. & Martinez, R. (1988). Improving instructor/student interaction with electronic mail. Engineering education. 247-250.

Durham, J. R. & Sunal, D. W. (1991). The enhancement of teacher education through the use of communication technology. Paper presented at the Annual Meeting of the Association of Teacher Educators. New Orleans, LA., February, 1991.

Fann, G. L., Lynch, D H. & Murranka, P. (1989). Integrating technologies: Attitudes as a determinant on the use of microcomputers. Journal of educational technology systems. 17(4), 307-317.

Gould, K. (1991). Indiana's high-tech elementary school. Principal. 11-13.

Heinssen, R. K. Jr., Glass, C. R. & Knight, L. A. (1987). Assessing computer anxiety: Development and validation of the computer anxiety rating scale. Computers in human behavior. 3, 49-59.

Honey, M. & Henriquez, A. (1993). Telecommunications and K-12 educators: Findings from a national survey. New York: Center for Technology in Education, Bank Street College.

Hopkins, M. (1991). The saturn school: Technology's cutting edge. Principal. 16-19.

Kay, R. H. (1990). The relation between locus of control and computer literacy. Journal of research on computing in education. 22(4), 464-474.

Lenk, C. (1988). Doing science through telecommunications. in J. D. Ellis (Ed.). 1988 AETS yearbook: Information technology and science education. (1988). Association for the Education of Teachers in Science.

Lewis, P. H. (1991). The technology of tomorrow. Principal, 6-7.

McCarty, P. (1991). Bringing the world into the classroom. Principal. 8-9.

Pool, R. (1993). Beyond databases and e-mail. Science. 261, 841-843.

Stahlhut, R. & Hawkes, R. (1991). Connections with practitioners adds excellence to teacher education. Paper presented at the National Meeting of the American Association of Colleges for Teacher Education. Atlanta, GA., February, 1991.

Summers, M. (1990). New student teachers and computers: An investigation of experiences and feelings. Educational review. 42(3), 261-271.

Thompson, A. D. & Hamilton, J. (1991). Patters of use of an electronic communications network for student teachers and first year teachers. (ERIC Document Reproduction Service).

Woodrow, J. J. (1990). Locus of control and student teacher computer attitudes. Computers in education. 14(5), 421-432.